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ONTARIO WATER
RESOURCES COMMISSION

ANNUAL REPORT 1964

HUNTSVILLE

water pollution control plant

TD227
H86
W38
1964
MOE

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DIVISION OF PLANT OPERATIONS

Ontario Water Resources Commission

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ONTARIO WATER RESOURCES COMMISSION

OFFICE OF THE GENERAL MANAGER

Members of the Huntsville Local Advisory Committee,
Town of Huntsville.

Gentlemen:

We are pleased to provide you with the 1964 Operating Report for the Huntsville Water Pollution Control Plant, OWRC Project No. 58-S-15.

By continuing the mutual cooperation which has existed in the past, we can look forward to greater progress in the field of water pollution control.

Yours very truly,

D. S. Caverly, P. Eng.,
General Manager

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1964
MOE

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General Manager,
Ontario Water Resources Commission.

Dear Sir:

It is with pleasure that I present to you the Annual Report of the operation of the Huntsville Water Pollution Control Plant, OWRC Project No. 58-S-15 for 1964.

This report presents design data, outlines operating problems encountered and summarizes in tables, charts and graphs all significant flow and cost data.

Yours very truly,

B C Palmer

B. C. Palmer, P. Eng.,
Director,
Division of Plant Operations.

FOREWORD

This report describes the operation of this project for the year 1964. It includes a detailed description of the project, summary of operation, graphs and charts showing quality and quantity information, and project cost data.

This information will be of value to the municipality in assessing the adequacy of the works in meeting existing requirements and in projecting its capability to meet future expected demands. The cost information will be of particular interest to those concerned with developing and maintaining revenue structures.

The preparation of this report has been a cooperative effort of several groups within the Division of Plant Operations. These include the Statistical Section, Brochures Officer and the Regional Supervisor. However, the primary responsibility for the content has been with the Regional Operations Engineer. He will be pleased to discuss all aspects of this report with the municipality.

B. C. Palmer, P. Eng.,
Director,
Division of Plant Operations.

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HUNTSVILLE
water pollution control plant

operated for

THE TOWN OF HUNTSVILLE

by the

ONTARIO WATER RESOURCES COMMISSION

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Assistant Director: C. W. Perry
Regional Supervisor: D. A. McTavish
Operations Engineer: M. B. Fielding

801 Bay Street **Toronto 5**

'64 REVIEW

The flow to the Huntsville Water Pollution Control Plant during 1964 averaged 0.173 mgd as compared to 0.177 mgd in 1963. The flow exceeded the plant design flow of 0.250 mgd 25% of the time as compared to 20% in 1963.

The strength of the influent sewage during 1963 was consistent with average domestic sewage, having an average BOD of 136 ppm and an average suspended solids content of 194 ppm. The plant efficiency for the year was consistent with design expectations for the activated sludge sewage treatment process, giving reductions of 95.0% and 92.5% in BOD and suspended solids respectively.

The cost of operating during 1964 was $10,121.07 representing a per capita cost, based on 3000 persons, of $3.37, or a cost of $159.75 per million gallons of sewage treated.

GLOSSARY

BOD	biochemical oxygen demand (a measure of organic content)
cfm	cubic feet per minute
comminution	shredding of solids into small fragments
DWF	dry weather flow
effluent	outflow
flocculation	bringing very small particles together to form a larger mass (the floc) before settling
fps	feet per second
gpcd	gallons per capita per day
gpm	gallons per minute
grit	sand, dust, stones, cinders and other heavy inorganic material
influent	inflow
lin. ft.	lineal feet
mgd	million gallons per day
mlss	mixed liquor suspended solids
ppm	parts per million
ss	suspended solids
TDH	total dynamic head (usually refers to pressure on a pump when it is in operation)

HISTORY
1957 - 1964

INCEPTION

On March 5, 1957 preliminary discussions were held with officials of the municipality of Huntsville to discuss proposals for a Water Pollution Control system for the town.

APPROVAL

A report prepared in 1954 by the consulting engineering firm of R. V. Anderson and Associates was updated, and on September 10, 1958, the OWRC issued its certificate of approval for the construction of sanitary sewers, three pumping stations and a sewage treatment plant.

CONSTRUCTION

The construction of this project was divided into two parts, Contract A and B. Contract A consisted of sanitary sewers while Contract B consisted of the construction of the Water Pollution Control plant and pumping stations. The total cost of the project was estimated at $498,743.00.

On November 18, 1959, the plant was officially put into operation.

This plant is designed to facilitate future construction of identical primary, aeration, final and digestion tanks thereby increasing the plant capacity to 500,000 Imperial gallons per day capable of serving a population of 6,000 persons.

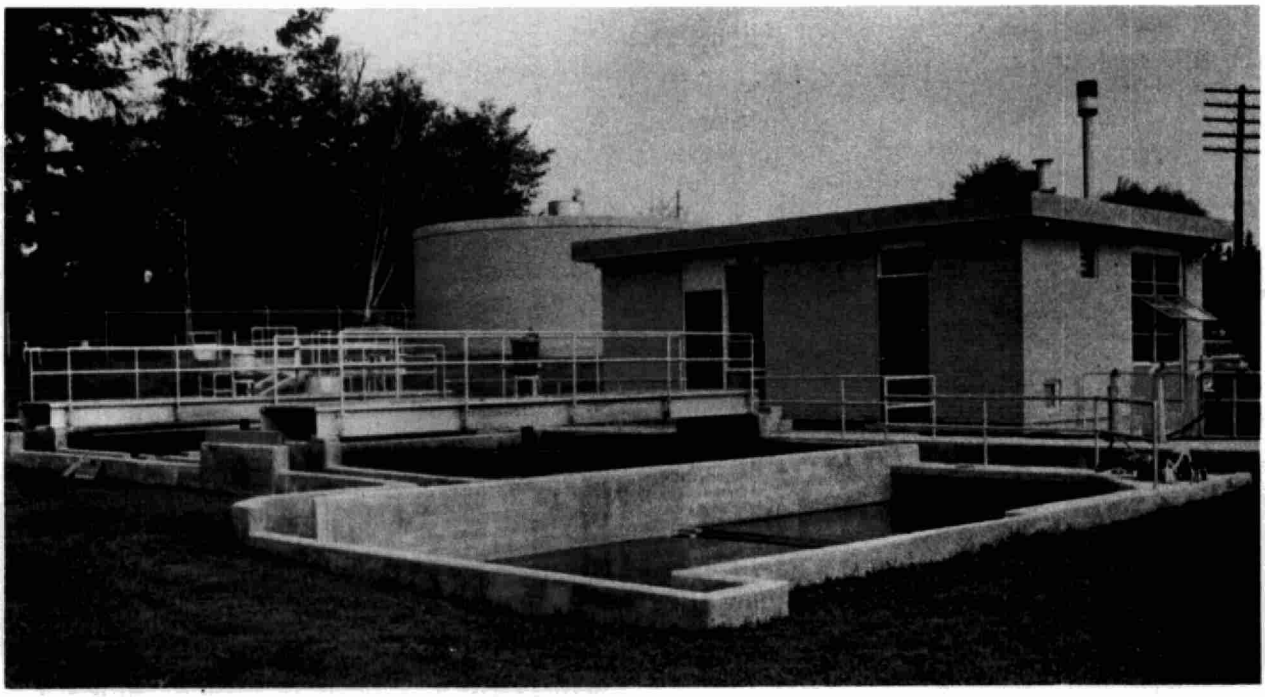


EDWIN C. DIPLOCK
CHIEF OPERATOR

Project Staff

This plant is staffed by one operator. During periods of absence of the Chief Operator or emergency a casual labourer is engaged. In order that a high quality effluent is maintained at all times, Mr. Diplock carries out daily tests, and sends samples once a month to the OWRC Laboratories in Toronto. He is also responsible for maintaining all the equipment, grounds and buildings on the plant site as well as the three pumping stations which are part of the project.

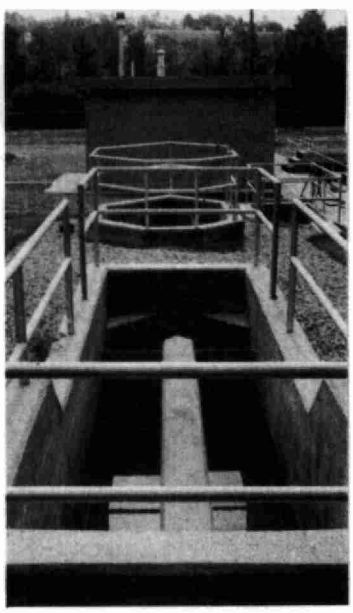
The operation of the project is under the supervision of the Division of Plant Operations. During the year, several visits were made by head office staff.



Description of Project

INFLUENT WORKS

The sewage from the municipality is collected in a number of sanitary and combined sewers. Most of the sewage flows by gravity to one of three pumping stations from which it is then directed to the sewage treatment plant.



The sewage enters the plant through a grit removal chamber where the sand, grit and silty material are removed. Bar screens which are cleaned by hand are provided after the grit chamber for the removal of large foreign objects which could possibly damage the plant equipment. Provision has been made for the future installation of a comminutor to grind up material now screened out. From the screens the sewage flows to the primary sedimentation tank.

PRIMARY SEDIMENTATION TANK

The sewage is settled in the primary sedimentation tank for approximately two hours before passing on to the aeration tanks. During this retention period, organic solids settle out and are collected by a travelling sludge collector and then are pumped to the digester.

AERATION

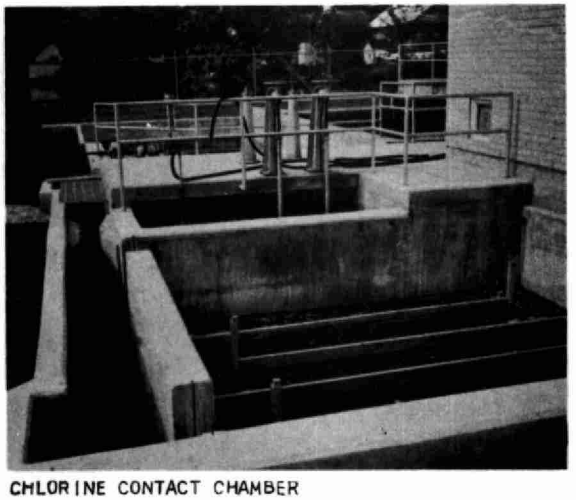
In the aeration section, the effluent from the primary sedimentation tank is mixed with activated sludge from the secondary sedimentation tank to form "mixed liquor". Air is introduced to the mixed liquor by two Chicago pump mechanical aerators. With properly controlled aeration, a highly settleable sludge floc is formed.



AERATION TANK

FINAL SEDIMENTATION TANK

The floc is allowed to settle out in the final settling tank. The clear sparkling effluent produced in this manner flows over the peripheral weirs of the final settling tank and through a Parshall flume where the total flow is measured.



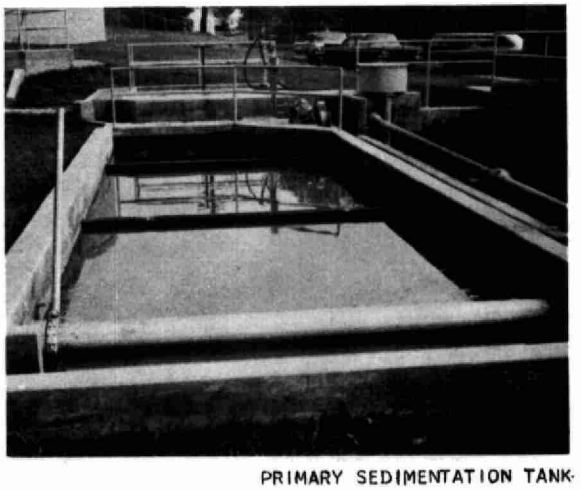
CHLORINE CONTACT CHAMBER

CHLORINE CONTACT CHAMBER

The effluent then flows to the chlorine contact chamber where it is chlorinated during the summer months as required by the Sanitary Engineering Division of the OWRC. It is then discharged to the Muskoka River.

SLUDGE DIGESTION TANKS

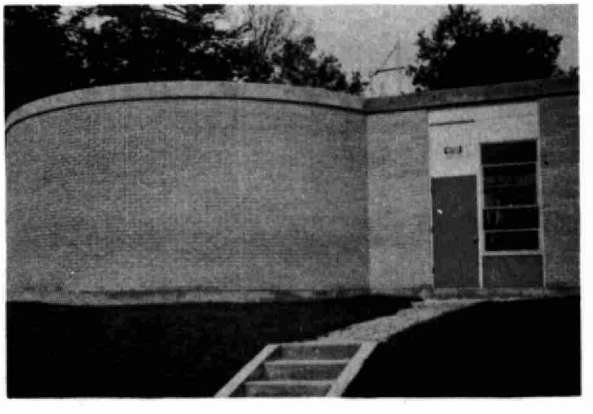
The sludge drawn from the primary tank and pumped to the digester is maintained at a temperature of 90° F. for a period of 28 days. The sludge is mixed and the digester temperature maintained by continually recirculating the liquid through a heat exchanger. Under this controlled environment, anaerobic bacterial action breaks down the raw sludge to a black, odourless liquid. During the process methane gas is produced which is then collected and used



PRIMARY SEDIMENTATION TANK

to heat the digester and control building.

The digested sludge is hauled away by tank truck and disposed of on farmers' fields where it makes an excellent soil conditioner.



PROJECT COSTS

TOTAL CAPITAL COST:	$498,743.00

The total cost to the municipality during 1964 was as follows:

Net Operating	$ 10,121.07
Debt Retirement	-
Reserve	4,000.00
Interest Charged	25,450.23
TOTAL	$ 39,571.30

RESERVE ACCOUNT

Balance at January 1, 1964	$ 7,448.96
Deposited by Municipality	4,000.00
Interest Earned	494,24
	$ 11,943.20
Less Expenditures	-
Balance at December 31, 1964	$ 11,943.20

DEBT OUTSTANDING	$452,389.00

MONTHLY COSTS

MONTH	TOTAL EXPENDITURE	PAYROLL	CASUAL PAYROLL	FUEL	POWER	CHEMICAL	GENERAL SUPPLIES	EQUIPMENT	REPAIRS & MAINTENANCE	*SUNDRY	WATER
JAN	363.77	293.52					16.63		6.82	46.80	
FEB	589.76	293.52		49.80	98.87		64.94	32.84	16.00	26.79	7.00
MARCH	920.86	329.02		49.80	104.76		4.75		34.77	397.76	
APRIL	1073.63	305.76	60.32	41.70	113.08		110.47		85.12	348.97	8.21
MAY	1418.75	458.64	54.72	36.10	114.37	574.03	11.80		70.89	98.20	
JUNE	1007.17	348.57		37.30	104.00		79.56		45.21	296.74	95.79
JULY	503.82	305.76		34.40	97.82	(105.00)	3.80	27.45	14.02	125.57	
AUG	1077.79	305.76		16.06	95.64		78.69		208.22	225.17	148.25
SEPT	435.88	305.76		13.05	103.50	(175.00)				188.57	
OCT	944.11	305.76	51.72	13.42	119.17	120.99	62.45	66.30		108.60	95.70
NOV	681.33	305.76	197.10	30.30	104.41	(105.00)			43.26	105.50	
DEC	1104.20	458.64	(51.72)	89.60	207.92	(70.00)	52.42	53.29	22.53	308.86	32.66
TOTAL	10121.07	4016.47	312.14	411.53	1263.54	240.02	485.51	179.88	546.84	2277.53	387.61

* SUNDRY INCLUDES SLUDGE HAULING COSTS WHICH WERE $1308.66

BRACKETS INDICATE CREDIT

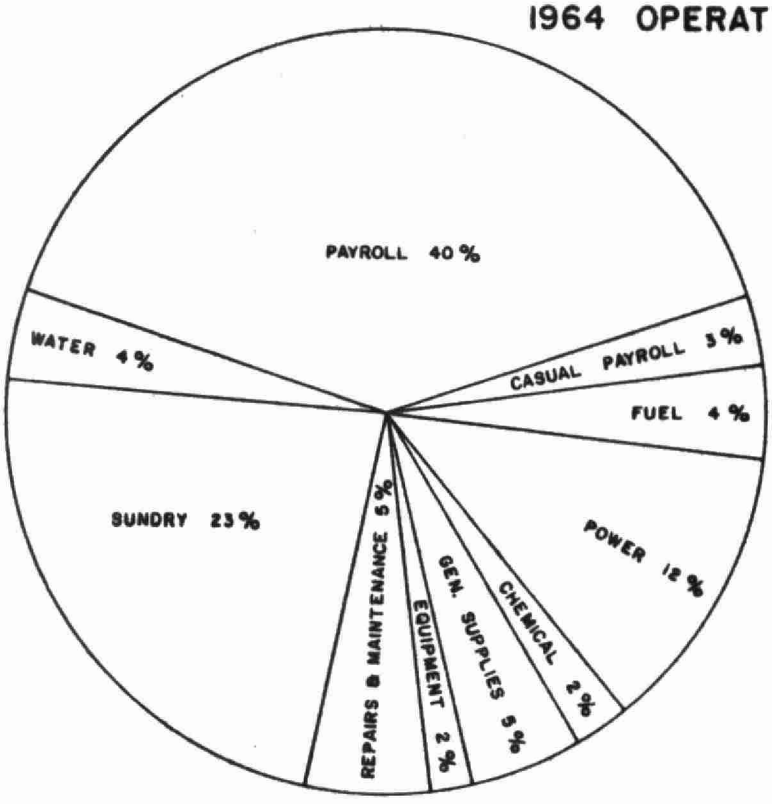
YEARLY COSTS

YEAR	M.G. TREATED	TOTAL COST	COST PER FAMILY PER YEAR	COST PER MILLION GALLONS	COST PER L.B. OF BOD REMOVED
1961	36.273	$ 8914.49	$11.58	$ 246.00	19 CENTS
1962	59.580	$ 8458.91	$11.00	$ 142.00	8 CENTS
1963	65.140	$ 9645.51	$12.56	$ 148.00	15 CENTS
1964	63.247	$10121.07	$12.83	$ 159.75	12 CENTS

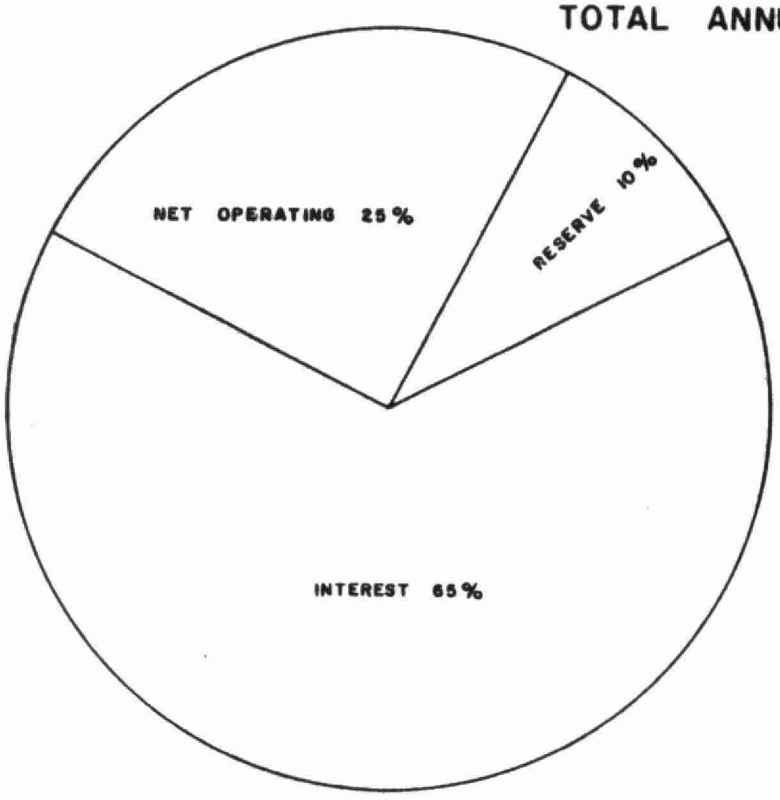
SUMMARY OF OPERATING EXPENSES

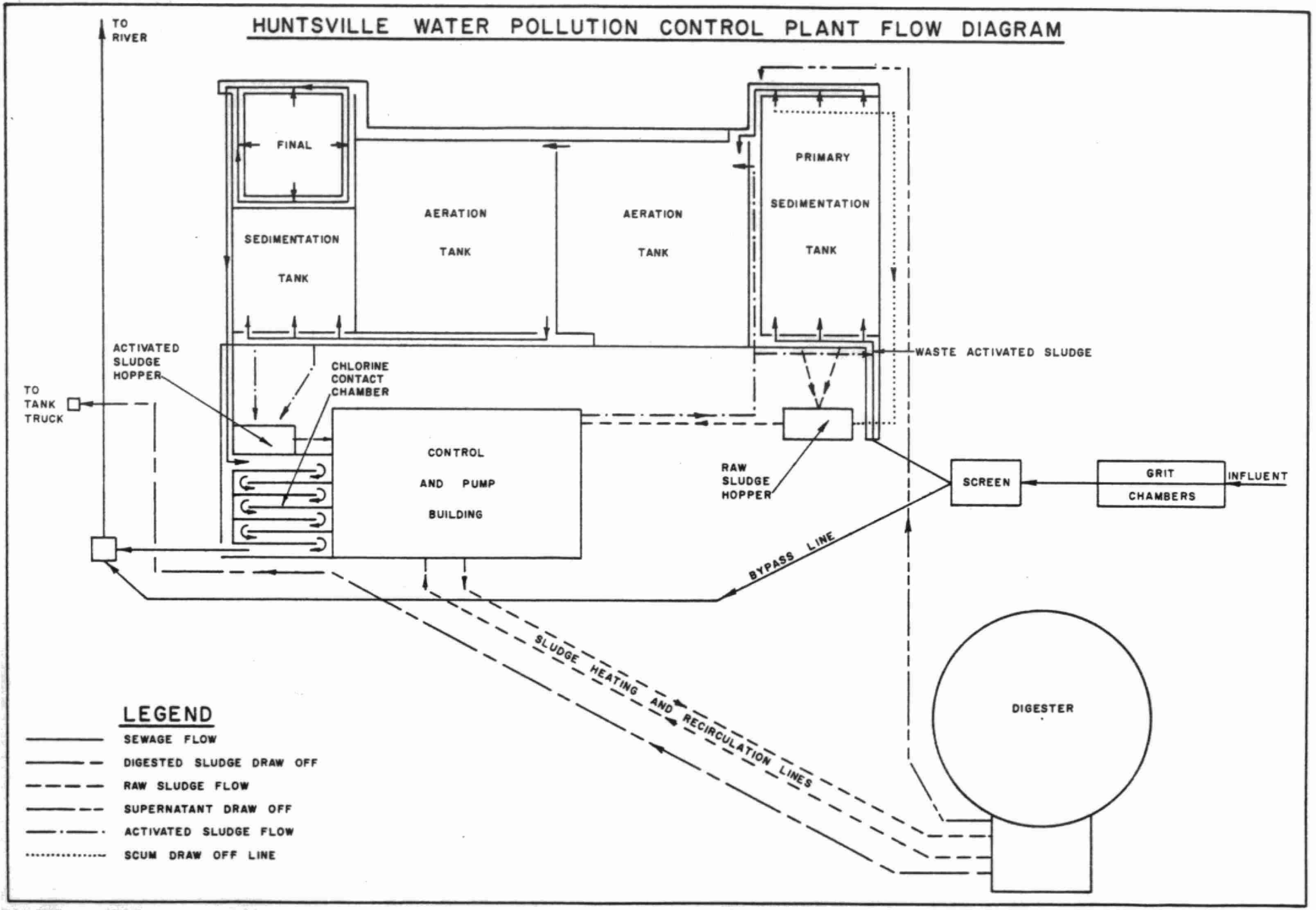
ITEM	COSTS 1961	COSTS 1962	COSTS 1963	COSTS 1964	BUDGET 1965
Payroll	$3,470.93	$3,721.99	$3,835.77	$4,016.47	$4,170
Casual Payl.	168.75	314.39	372.53	312.14	350
Fuel	595.05	487.87	491.94	411.53	480
Power	1,273.89	1,095.25	1,140.30	1,263.54	1,200
Water	213.76	255.50	388.95	387.61	360
Chemicals	(cr. 76.42)	222.15	326.41	240.02	300
Gen. Supp.	466.11	463.18	522.77	485.51	500
Equipment	Nil	180.20	Nil	179.88	200
Maint.& Rep.	121.19	107.18	621.61	546.84	500
Sludge Haulg.	890.62	1,180.66	1,050.80	1,308.66	1,020
Sundry	562.96	430.52	97.98	(	300
Ins. & Taxs.	1,227.65	37.68	394.72	(968.87 (	400
Travel	-	-	401.73	112.53	100
Contingency	-	-	-	-	120
TOTAL	8,914.49	8,458.91	9,645.51	10,121.07	10,000

1964 OPERATING COSTS



TOTAL ANNUAL COST




HUNTSVILLE WATER POLLUTION CONTROL PLANT FLOW DIAGRAM
TO RIVER
FINAL
SEDIMENTATION TANK
AERATION TANK
AERATION TANK
PRIMARY SEDIMENTATION TANK
ACTIVATED SLUDGE HOPPER
CHLORINE CONTACT CHAMBER
WASTE ACTIVATED SLUDGE
TO TANK TRUCK
CONTROL AND PUMP BUILDING
RAW SLUDGE HOPPER
SCREEN
GRIT CHAMBERS
INFLUENT
BYPASS LINE
SLUDGE HEATING AND RECIRCULATION LINES
DIGESTER
LEGEND
SEWAGE FLOW
DIGESTED SLUDGE DRAW OFF
RAW SLUDGE FLOW
SUPERNATANT DRAW OFF
ACTIVATED SLUDGE FLOW
SCUM DRAW OFF LINE

Technical Section

Design–Data

GENERAL

Type of Plant - Activated sludge with mechanical aeration.

Design Population - 3,000 persons.

Design Plant Flow - 250,000 gallons per day.

Per Capita Flow - 83 gallons per day.

Five Day BOD -

Raw Sewage	-	250 PPM
Removal	-	90-95%

Suspended Solids -

Raw Sewage	-	250 PPM
Removal	-	90-95%

PRIMARY TREATMENT

Grit Removal

Two parallel channels, 10 ft. long and 19 inches wide.

Volume - 52.5 cubic feet each.

Detention time - 1.9 minutes.

Screening

Provided by manually cleaned bar screen with provision for installing a comminutor.

Primary Sedimentation Tank

One tank 10 ft. x 30 ft. x 8 ft. deep.

Surface area - 300 square feet.

Volume - 2,400 cubic feet.

Detention time - 1.5 hours.

Surface Settling Rate - 833 gallons per sq. ft. of tank per day.

Overflow rate - 27,500 gallons per ft. of weir per day.

SECONDARY TREATMENT

Two tanks 24 ft. square by 12 ft. deep.

Volume - 14,000 cubic feet.

Detention time - 6.75 hours with 25% return sludge.

Air Supply - by mechanical aerators.

Final Sedimentation Tank

One tank 30 ft. x 13 ft. x 12 ft. deep.

Surface area - 390 square feet.

Volume - 4,700 cubic feet.

Detention time - 3 hours.

Surface Settling Rate - 640 gallons per ft. per day.

Overflow rate - 4400 gallons per lineal ft. of weir per day.

Chlorine Contact Chamber

One tank 12 ft. x 11.5 ft. x 10 ft. 3 in. side wall depth.

Detention time - 36 minutes.

Maximum dosage - 20 lbs. of chlorine per day.

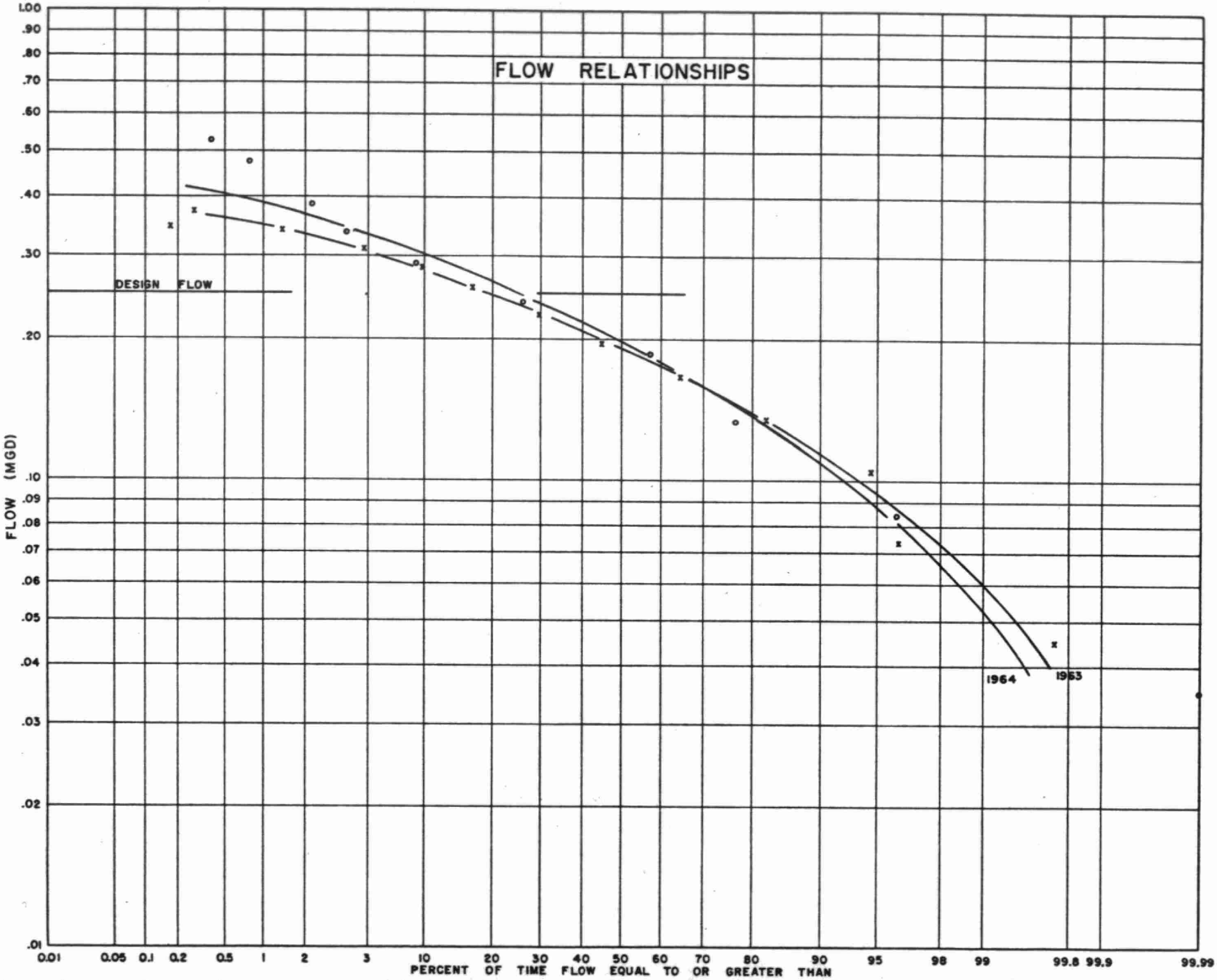
Outfall Works

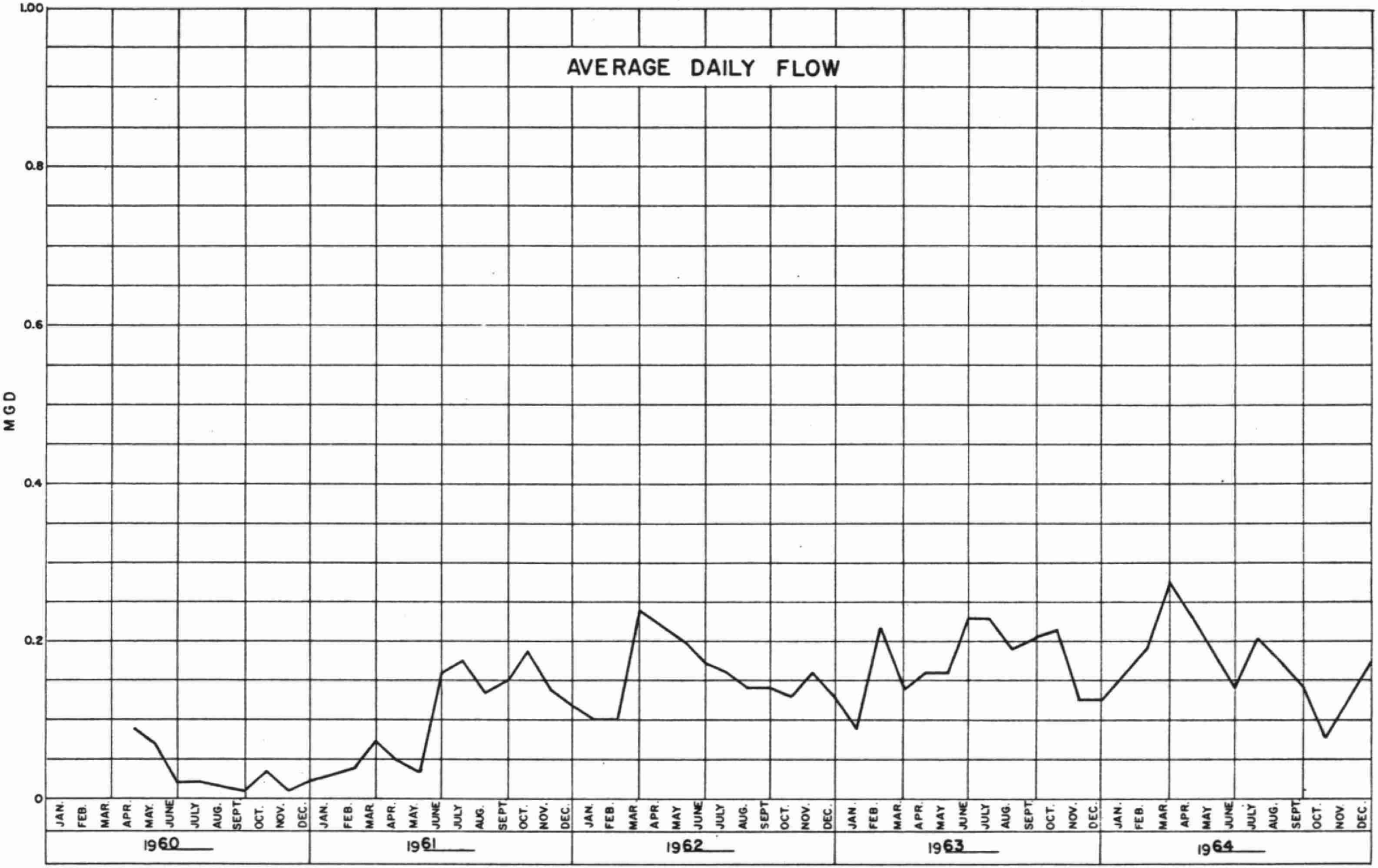
The effluent is discharged to the Muskoka River through 105 ft. of 15 inch corrugated metal pipe.

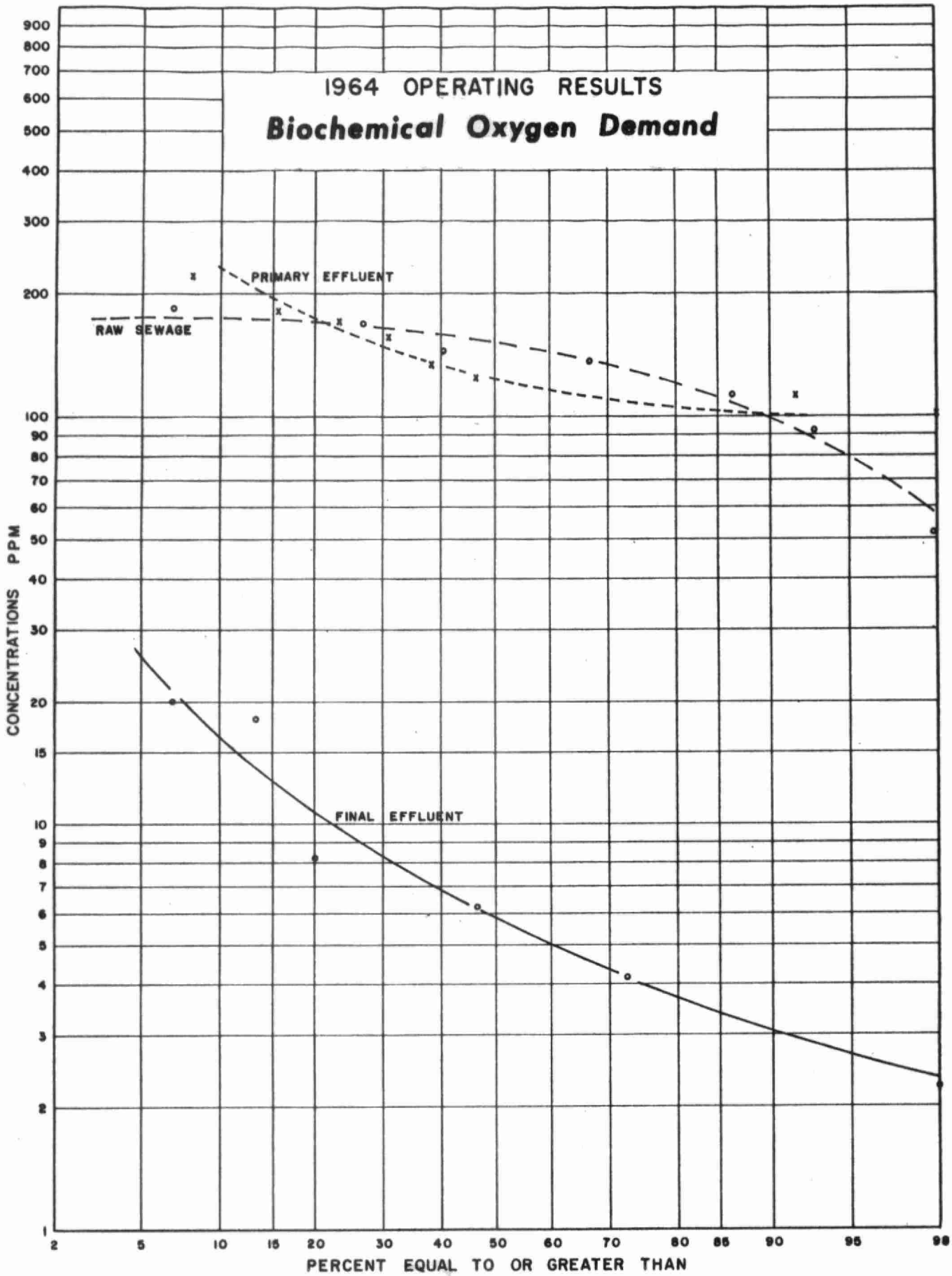
Digestion System

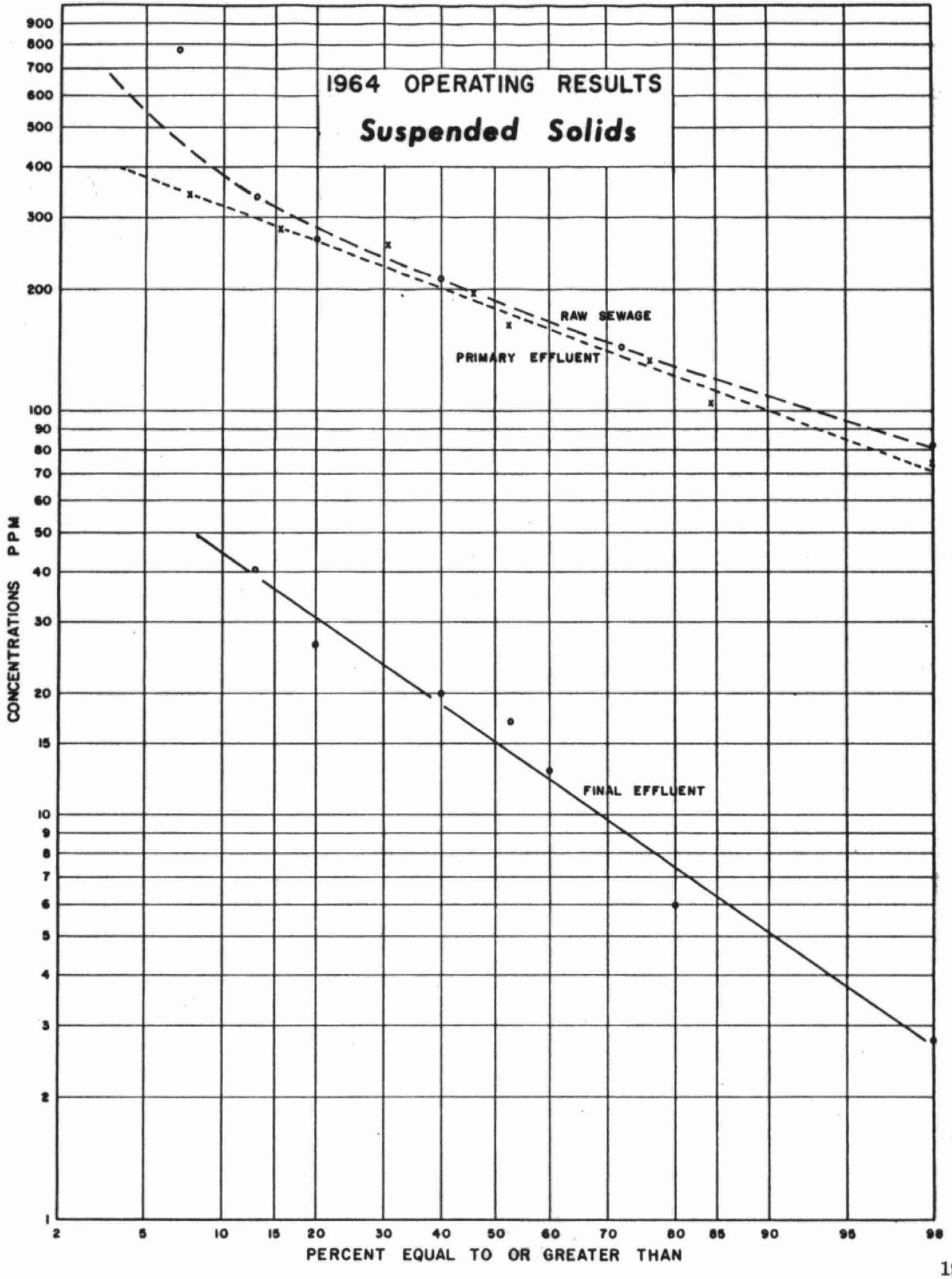
One single stage digester 30 ft. in diameter by 20 ft. side wall depth.

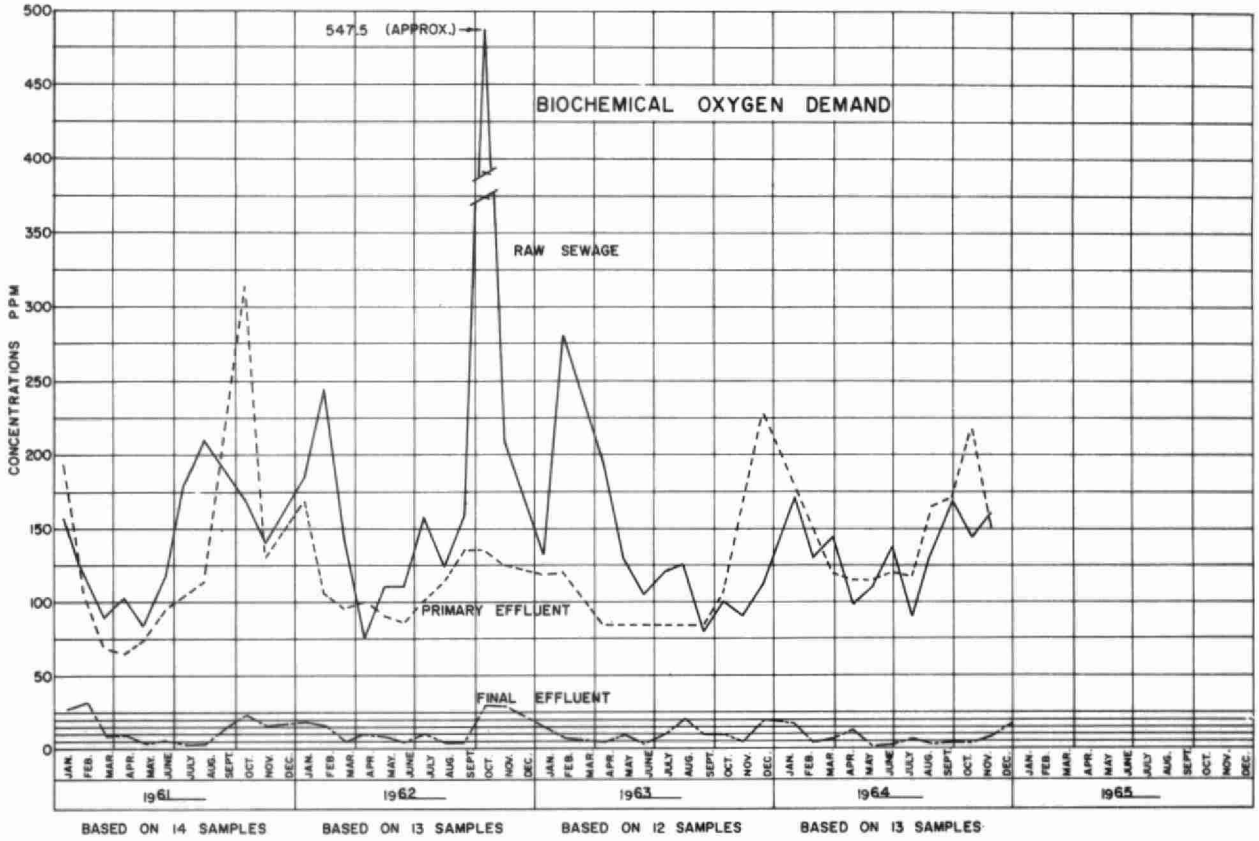
Heated digester capacity is 5 cubic feet per capita.


FLOW RELATIONSHIPS
DESIGN FLOW
1964
1963
FLOW (MGD)
1.00
.90
.80
.70
.60
.50
.40
.30
.20
.10
.09
.08
.07
.06
.05
.04
.03
.02
.01
0.01 0.05 0.1 0.2 0.5 1 2 3 10 20 30 40 50 60 70 80 90 95 98 99 99.8 99.9 99.99
PERCENT OF TIME FLOW EQUAL TO OR GREATER THAN

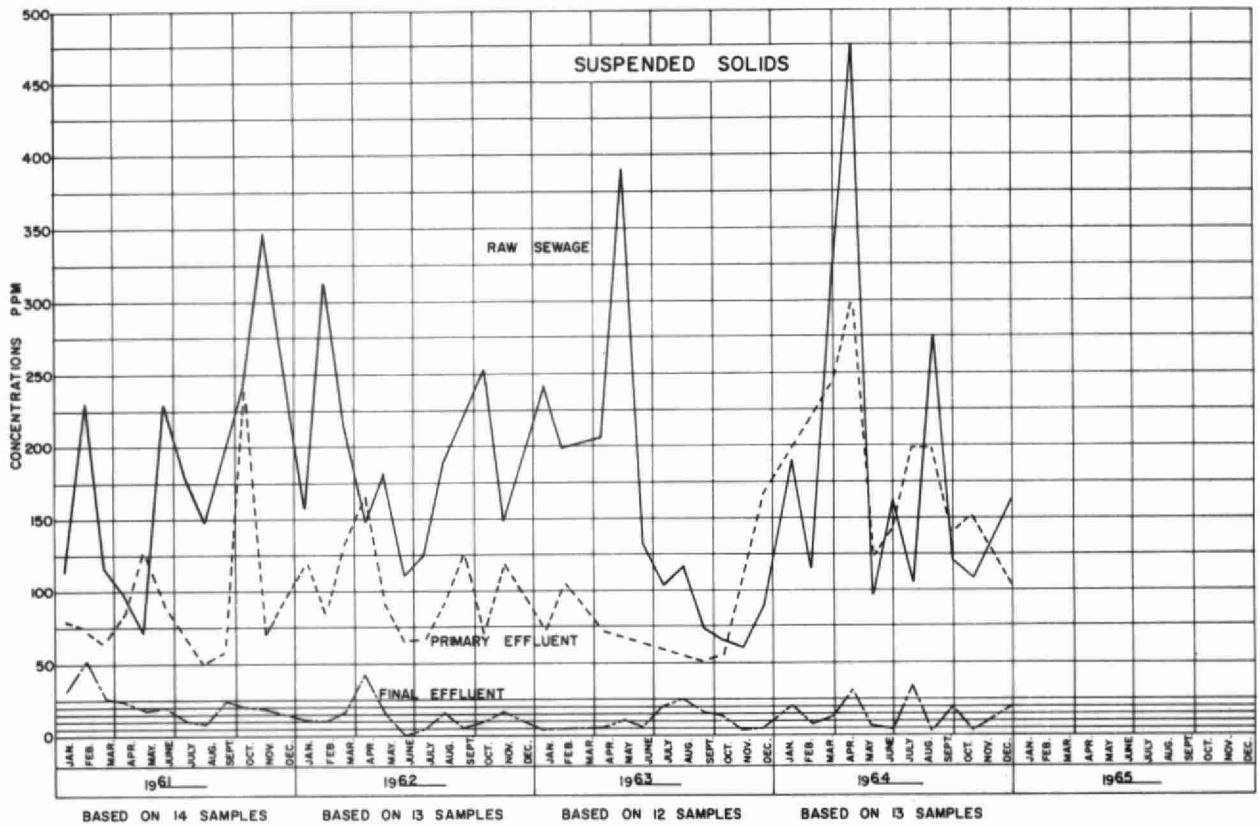

AVERAGE DAILY FLOW
1.00
0.8
0.6
0.4
0.2
0
MGD
JAN. FEB. MAR. APR. MAY. JUNE JULY AUG. SEPT OCT. NOV. DEC.
1960
1961
1962
1963
1964


1964 OPERATING RESULTS
Biochemical Oxygen Demand
PRIMARY EFFLUENT
RAW SEWAGE
FINAL EFFLUENT
CONCENTRATIONS PPM
900
800
700
600
500
400
300
200
100
90
80
70
60
50
40
30
20
15
10
9
8
7
6
5
4
3
2
1
2
5
10
15
20
30
40
50
60
70
80
85
90
95
98
PERCENT EQUAL TO OR GREATER THAN


1964 OPERATING RESULTS
Suspended Solids
RAW SEWAGE
PRIMARY EFFLUENT
FINAL EFFLUENT
CONCENTRATIONS PPM
PERCENT EQUAL TO OR GREATER THAN
900
800
700
600
500
400
300
200
100
90
80
70
60
50
40
30
20
15
10
9
8
7
6
5
4
3
2
1
2
5
10
15
20
30
40
50
60
70
80
85
90
95
98



MONTHLY VARIATIONS



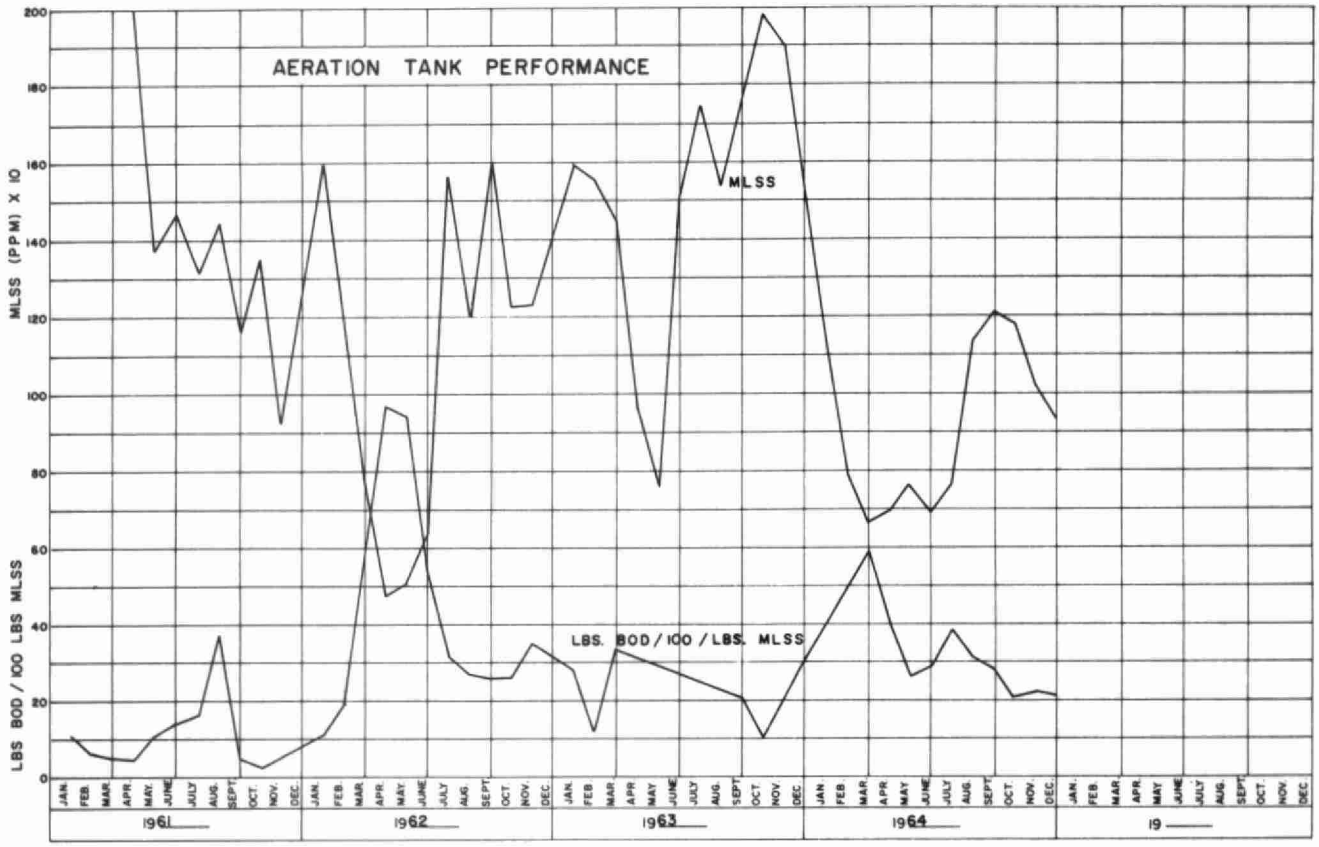
GRIT, B.O.D AND S.S. REMOVAL

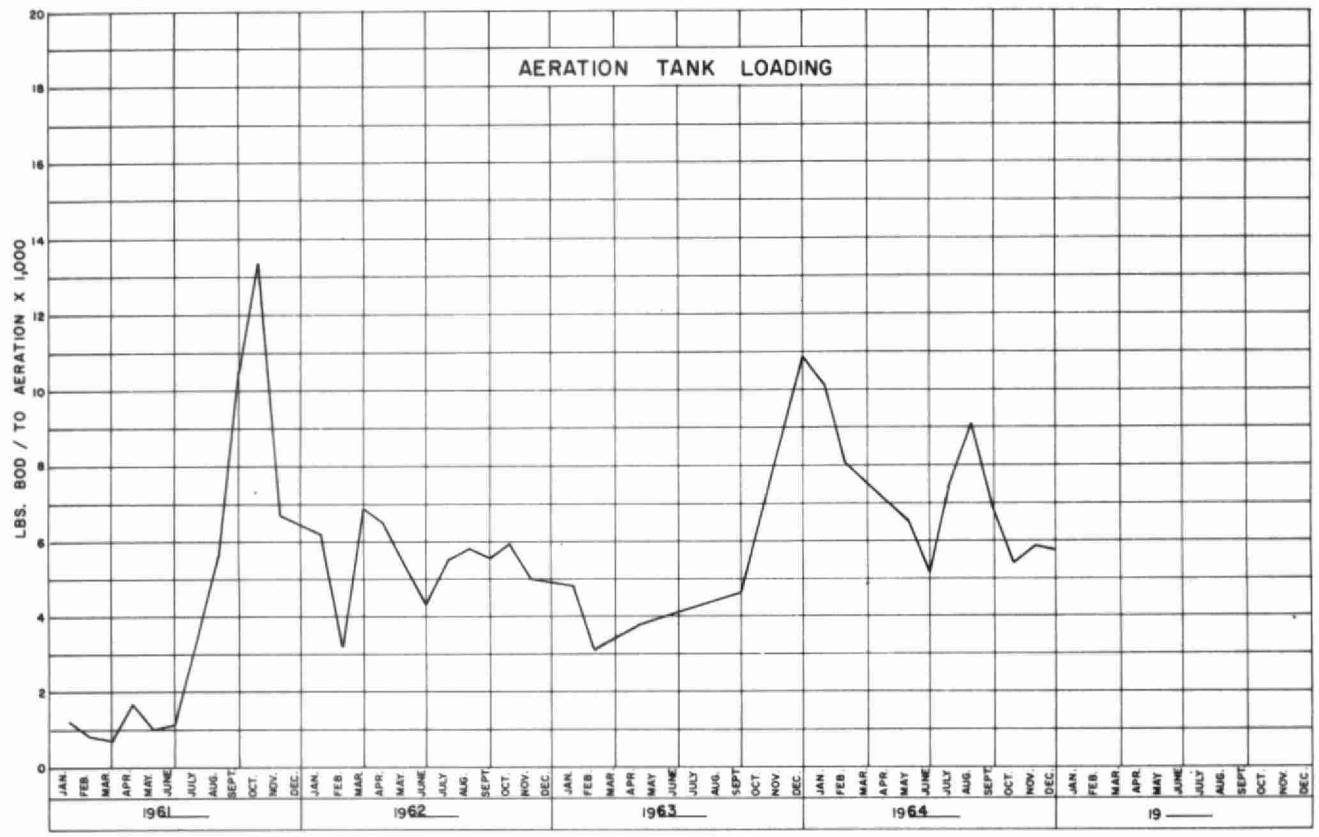
MONTH	B. O. D.				S. S.				GRIT REMOVAL CU. FT.
	INFLUENT P.P.M.	EFFLUENT P.P.M.	% REDUCTION	TONS REMOVED	INFLUENT P.P.M.	EFFLUENT P.P.M.	% REDUCTION	TONS REMOVED	
JAN.	170	18	89.5	3.7	190	20	89.5	4.1	7
FEB.	130	4.8	96.5	3.5	114	8	93	2.9	17
MAR.	145	5.8	96	5.9	326	12	96.5	13.3	25
APR.	99	12.8	87	3	472	30	93.5	15.4	46
MAY	110	1.8	98.5	3.1	98	6	94	2.6	64
JUNE	139	2.1	98.5	2.9	162	4	97.5	3.4	33
JULY	90	6	93.5	2.6	103	34	67.0	2.2	23
AUG.	135	2.8	98.0	3.6	276	2	99.0	7.5	22
SEPT.	170	4.4	97.5	3.4	120	19	84.0	2.0	20
OCT.	145	4.2	97.0	1.7	108	4	96.0	1.3	12
NOV.	160	8	95.0	2.9	163	19	88.5	2.8	25
DEC.	*136	6.4	95.0	3.4	194	14	92.5	4.8	16
TOTAL	–	–	–	41.0	–	–	–	56.9	310
AVG.	136	6.4	95.0	3.4	194	14	92.5	4.7	26

* average values substituted. No samples.

COMMENTS

The influent sewage during 1964 contained 136 ppm BOD and 194 ppm suspended solids. These values are consistent with average domestic sewage. The treatment process effected an average reduction in BOD and suspended solids of 95.0% and 92.5% respectively.


AERATION TANK PERFORMANCE
MLSS (PPM) X 10
LBS BOD / 100 LBS MLSS
MLSS
LBS. BOD / 100 / LBS. MLSS
200
180
160
140
120
100
80
60
40
20
0
JAN. FEB. MAR. APR. MAY. JUNE JULY AUG. SEPT. OCT. NOV. DEC.
1961
1962
1963
1964
19

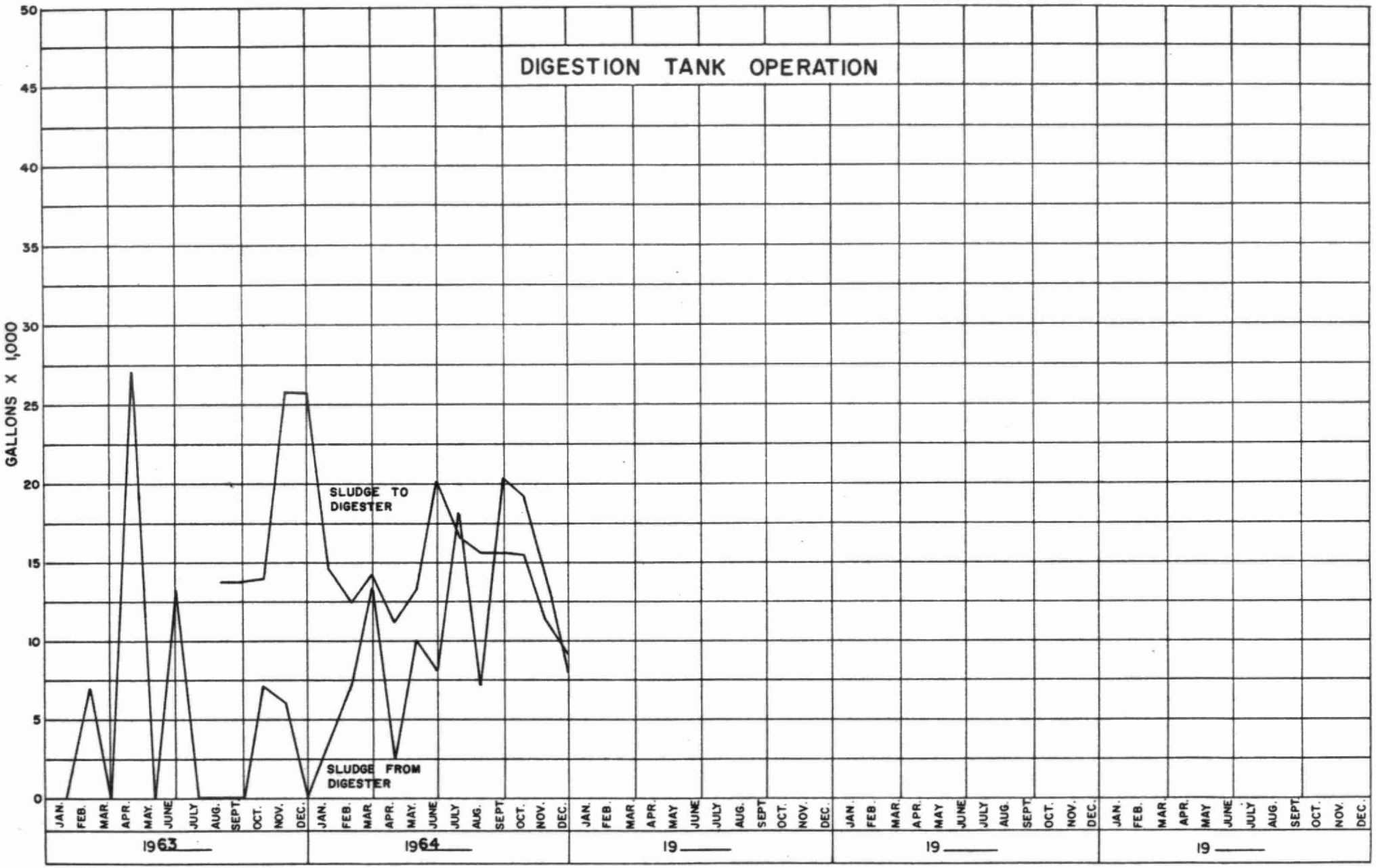

AERATION TANK LOADING
LBS. BOD / TO AERATION X 1,000
20
18
16
14
12
10
8
6
4
2
0
JAN. FEB. MAR. APR. MAY. JUNE JULY AUG. SEPT. OCT. NOV. DEC.
1961
1962
1963
1964
19

AERATION SECTION

MONTH	PRIM. EFFL. B.O.D. P.P.M.	M.L.S.S. P.P.M.	LBS. BOD. PER 100 LBS. M. L. S. S.	CUBIC FEET AIR PER LB. B.O.D. REMOVED
JANUARY	–	773	–	–
FEBRUARY	–	785	–	–
MARCH	120	663	59	–
APRIL	115	728	40	–
MAY	115	763	26	–
JUNE	120	694	29	–
JULY	118	762	38	–
AUGUST	165	1137	31	–
SEPTEMBER	170	1207	28	–
OCTOBER	220	1180	21	–
NOVEMBER	152	1023	22	–
DECEMBER	–	932	–	–
TOTAL	–	–	–	–
AVERAGE	143	887	33	–

COMMENTS

The values of 887 ppm for mixed liquor suspended solids and 33 pounds of BOD per 100 pounds of mixed lqiuor suspended solids are within the recommended values for efficient plant operation.


DIGESTION TANK OPERATION
GALLONS X 1,000
50
45
40
35
30
25
20
15
10
5
0
SLUDGE TO DIGESTER
SLUDGE FROM DIGESTER
JAN. FEB. MAR. APR. MAY. JUNE JULY AUG. SEPT OCT. NOV. DEC.
1963
1964
19____
19____
19____

DIGESTER OPERATION

MONTH	SLUDGE TO DIGESTERS			SLUDGE FROM DIGESTERS			GAS PRODUCED 1000'S Cu. Ft.
	1000'S CU.FT.	% SOLIDS	% VOL. MAT.	1000'S CU. FT.	% SOLIDS	% VOL. MAT	
JAN.	2.34	5.42	–	–	4.71	–	–
FEB.	2.01	4.25	–	1.13	7.73	–	–
MAR.	2.28	6.50	–	2.13	5.50	–	–
APR.	1.80	3.93	–	0.81	0.19	–	–
MAY	2,10	4.75	–	1.62	8.10	–	–
JUNE	3.27	4.12	–	1.30	1.08	–	–
JULY	2.69	5.24	–	2.92	1.74	–	–
AUG.	2.50	4.65	–	1.17	1.82	–	–
SEPT.	2.50	3.82	–	3.24	3.85	–	–
OCT.	2.48	5.28		3.08	1.04	–	–
NOV.	1.84	4.76	–	2.27	3.37	–	–
DEC.	1.44	–	–	1.30	–	–	–
TOTAL	27.25	–	–	20.97	–	–	–
AVG.	2.27	4.79	–	1.75	3.56	–	–

COMMENTS

The total sludge pumped to the digesters was 27,250 cubic feet while 20,970 cubic feet were removed. This indicates that the sludge solid content was reduced approxi-23% which is acceptable for single stage digestion.

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Ontario Water Resources Co
Huntsville water
pollution control plant: atfk
annual report c.1 a aa
1964

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